CLAIMS

What is claimed is:

1. A macroscopic mirror for wide angle scanning applications comprising:

a silicon substrate section of a predetermined shape and macroscopic size cut from a silicon wafer comprising a flat, polished surface side and an etched, rough surface side; and

a plurality of layers, including a layer of reflective medium, disposed on the flat, polished surface of said substrate section in such a manner to minimize flexural distortion of said flat surface.

2. The macroscopic mirror of claim 1 wherein the reflective medium being selected for an at least one wavelength of radiation to be reflected thereby.

3. The macroscopic mirror of claim 1 wherein the reflective medium is selected from the group consisting of gold and silver.

4. The macroscopic mirror of claim 1 wherein the etched, rough surface side of the silicon substrate serves as a backing plate for bonding the mirror to a scan drive mechanism.

5. The macroscopic mirror of claim 1 wherein the plurality of layers comprise a bottom primer layer, a middle reflective medium layer and a top protective coating layer.

6. The macroscopic mirror of claim 5 wherein each layer of the plurality of layers is applied by sputtering to a predetermined thickness.

7. The macroscopic mirror of claim 1 wherein the mirror has a thermal distortion coefficient in the range of 0.020 to 0.032.

8. The macroscopic mirror of claim 1 wherein the substrate section is cut from the wafer in the form of an ellipse having a major axis dimension of approximately 70 mm and a minor axis dimension of approximately 50 mm.

9. The macroscopic mirror of claim 1 wherein the silicon wafer from which the substrate section is cut has a thickness of less than 1 mm.

10. The macroscopic mirror of claim 1 wherein the substrate section is laser cut from the silicon wafer.

11. A method of making a macroscopic mirror for wide angle scanning applications comprising:

preparing a silicon wafer by polishing one side to a predetermined flatness and etching the other side to a predetermined roughness;

cutting a substrate section from the prepared silicon wafer to a predetermined shape and macroscopic size; and

applying a plurality of layers, including a layer of reflective medium, on the flat, polished surface of said substrate section in such a manner to minimize flexural distortion of said flat surface.

12. The method of claim 11 wherein the substrate section is cut from the silicon wafer in a cookie cutter fashion.

13. The method of claim 11 wherein the substrate section is laser cut from the silicon wafer.

14. The method of claim 11 wherein the step of applying includes the steps of:

applying a primer layer to a first predetermined thickness on the flat, polished surface of the substrate section;

applying the reflective medium layer to a second predetermined thickness on the primer layer; and

applying a protective coating layer to a third predetermined thickness on the reflective medium layer.

15. A mirror system for wide angle scanning a radiation beam, said system comprising:

a macroscopic mirror comprising:

a silicon substrate section of a predetermined shape and macroscopic size cut from a silicon wafer, said substrate section comprising a flat, polished surface side and an etched, rough surface side; and

a plurality of layers, including a layer of reflective medium, disposed on the flat, polished surface of said substrate section in such a manner to minimize flexural distortion of said flat surface;

a mirror drive mechanism including a plurality of supporting arms; and

wherein the rough surface side of said macroscopic mirror being bonded to said supporting arms of the drive mechanism, said mirror drive mechanism for scanning said macroscopic mirror at a predetermined scanning rate in at least one plane of rotation.

16. The system of claim 15 wherein the macroscopic mirror is bonded to the supporting arms of the drive mechanism in such a manner to minimize flexural distortion of said flat surface.

17. The system of claim 15 wherein the drive mechanism scans the macroscopic mirror at a scanning rate of approximately 100 Hz..

18. The system of claim 15 wherein the mirror drive mechanism scans the macroscopic mirror through a scan angle of at least 30° peak to peak.

19. The system of claim 15 wherein the macroscopic mirror operates to reflect a large beamwidth of laser energy through a predetermined pattern and to receive backscatterings from the laser energy.

20. The system of claim 15 wherein the mirror drive mechanism comprises a resonant scanner.